

CLAIMS:

1. A beverage maker comprising:
 - a water reservoir (2);
 - a closed water boiler (5);
 - a beverage brewing unit (8);
 - 5 a water supply channel (25) interconnecting the reservoir (2) and the boiler (5);
 - a water discharge channel (19) interconnecting the boiler (5) and the beverage brewing unit (8);
 - a pump (3) for pumping water from the boiler (5) to the beverage brewing unit 10 (8);
 - a return channel (25) interconnecting the reservoir (2) and the boiler (5); and
 - a valve structure (7; 47; 107) having an inlet (9; 109) connected for water inflow from the boiler (5) and the pump (3), a return outlet (16; 116) connected for returning water to the reservoir (2), and a discharge outlet (20; 120) connected for water outflow to the 15 brewing unit (8), the valve structure (13; 43; 153) being adapted for:
 - preventing water passage from said inlet (9; 109) to said return outlet (16; 116) if the water pressure at said inlet (9; 109) is below a relief pressure value;
 - allowing water passage from said inlet (9; 109) to said return outlet (16; 116) if the water pressure at said inlet (9; 109) is above said relief pressure value and below a shut- 20 off pressure;
 - preventing water passage from said inlet (9; 109) to said return outlet (16; 116) if the water pressure at said inlet (9; 109) is above said shut-off pressure value;
 - preventing water passage from said inlet (9; 109) to said discharge outlet (20; 120) if the water pressure at said inlet (9; 109) is below a discharge pressure value; and
 - 25 allowing water passage from said inlet (9; 109) to said discharge outlet (20; 120) if the water pressure at said inlet (9; 109) is above said discharge pressure value;
 - wherein said relief pressure value, said shut-off pressure value, and said discharge pressure value are predetermined at least to the extent that:
 - said relief pressure value is above atmospheric pressure;

said relief pressure value is lower than each of said shut-off pressure value and said discharge pressure value; and

said shut-off pressure value and said discharge pressure value are each lower than a pumping pressure at said inlet (9; 109) generated by said pump (3) when said pump is
5 in operation.

2. A beverage maker according to claim 1, wherein the valve structure (7; 47) comprises:

a return flow control valve (13; 43) between an inlet portion (14) connected
10 for water inflow from the boiler (5) and the pump (3) and said return outlet (18), said return flow control valve (13; 43) being adapted for:

preventing water passage from said inlet (9) to said return outlet (16) if the water pressure at said inlet portion (14) is below said relief pressure value;

allowing water passage from said inlet (9) to said return outlet (16) if the water
15 pressure at said inlet portion (14) is above said relief pressure value and below said shut-off pressure; and

preventing water passage from said inlet (9) to said return outlet (16) if the water pressure at said inlet portion (14) is above said shut-off pressure value; and

a discharge control valve (10) between the inlet (9) and the discharge outlet
20 (20), the discharge control valve (10) being adapted for:

preventing water passage from said inlet (9) to said discharge outlet (20) if the water pressure at said inlet (9) is below said discharge pressure value; and

allowing water passage from said inlet (9) to said discharge outlet (20) if the water pressure at said inlet (9) is above said discharge pressure value.

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3. A beverage maker according to claim 1, wherein the valve structure (107) comprises:

a return flow control valve (153) between an inlet portion (154) connected for water inflow from the boiler (5) and the pump (3) and the return outlet (116), the return flow
30 control valve (153) being adapted for:

preventing water passage from said inlet (109) to said return outlet (116) if the water pressure at said inlet portion (154) is below said relief pressure value; and

allowing water passage from said inlet (109) to said return outlet (116) if the water pressure at said inlet portion (154) is above said relief pressure value and below said shut-off pressure; and

5 a discharge and return flow control valve (110) downstream of the inlet (109) and upstream of the discharge outlet (120) and the return outlet (116), the discharge and return flow control valve (110) being adapted for:

preventing water passage from said inlet (109) to said return outlet (116) if the water pressure at said inlet (109) is above said shut-off pressure value;

10 preventing water passage from said inlet (109) to said discharge outlet (120) if the water pressure at said inlet (109) is below said discharge pressure value; and

allowing water passage from said inlet (109) to said discharge outlet (120) if the water pressure at said inlet (109) is above said discharge pressure value.

4. A beverage maker according to claim 1 or 2, wherein said discharge pressure value is predetermined to be equal to or higher than said shut-off pressure value.

5. A beverage maker according to claim 1 or 2, wherein said relief pressure value is at least 0.1 bar over atmospheric pressure.

20 6. A beverage maker according to any one of the preceding claims, wherein said relief pressure value is at most 0.5 bar over atmospheric pressure.

7. A beverage maker according to any one of the preceding claims, wherein said shut-off pressure value is at least 0.4 bar over atmospheric pressure.

25 8. A beverage maker according to any one of the preceding claims, wherein said shut-off pressure value is at most 1.4 bar over atmospheric pressure.

9. A beverage maker according to any one of the preceding claims, wherein said discharge pressure is at least 0.8 bar over atmospheric pressure

30 10. A beverage maker according to at least claim 2 or 3, wherein the discharge control valve has a valve body (11; 111), the return flow control valve (13; 43; 153) being an integral part of the discharge control valve body (11; 111).

11. A beverage maker according to any one of the preceding claims, wherein the valve structure is dimensioned for venting all water flow caused by expansion in the boiler owing to a pressure lying above the relief pressure and induced by the heater (30).
- 5 12. A beverage maker according to any one of the preceding claims, further comprising a restriction (21) in the discharge channel (19) downstream of and closely adjacent to the valve body (11) of the discharge control valve (10; 110).
- 10 13. A beverage maker according to any one of the preceding claims, wherein, in closed condition, a valve body (11) preventing water passage from said inlet (9) to said discharge outlet has a first surface area communicating with the boiler (5) and, in opened condition allowing water passage from said inlet (9) to said discharge outlet, said valve body (11) has a second surface area communicating with the boiler (5), said second surface area
15 being larger than said first surface area.
14. A beverage maker according to at least claim 2 or 3, wherein the discharge control valve (10; 110) and the return flow control valve (43) are coupled for causing the
20 return flow control valve (43) to be closed off in response to an opening of the discharge control valve (10; 110).